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(54) **Receiver circuit arrangement with automatic gain control**

(57) A receiver circuit arrangement, particularly for television, comprises a tuner 1 and a detector 14 arranged to provide a signal representative of the level of an I.F. signal afforded by the tuner, and a comparator 15 for comparing the representative signal with a reference level 16 to provide an automatic gain control signal 4 for the tuner. The circuit also includes a surface acoustic wave filter 8 and amplifiers 7, 9 which may also be provided with AGC.

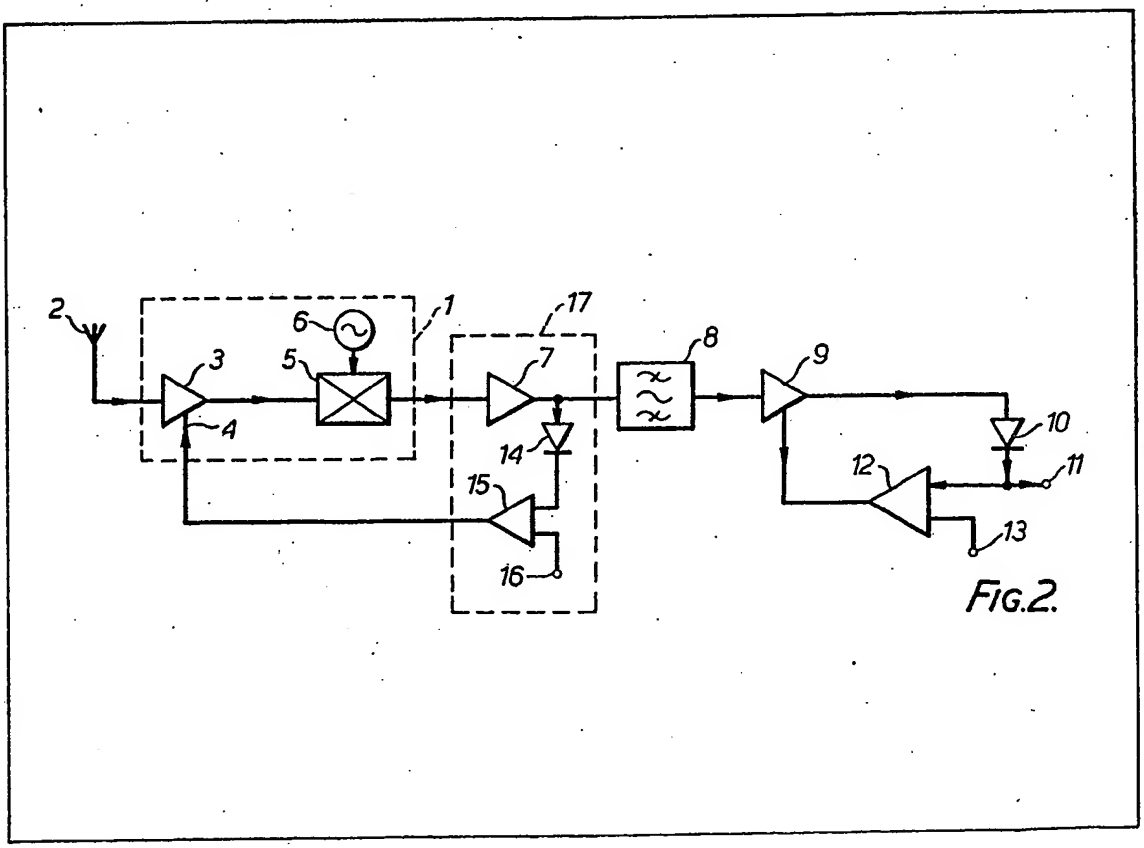

FIG.2.

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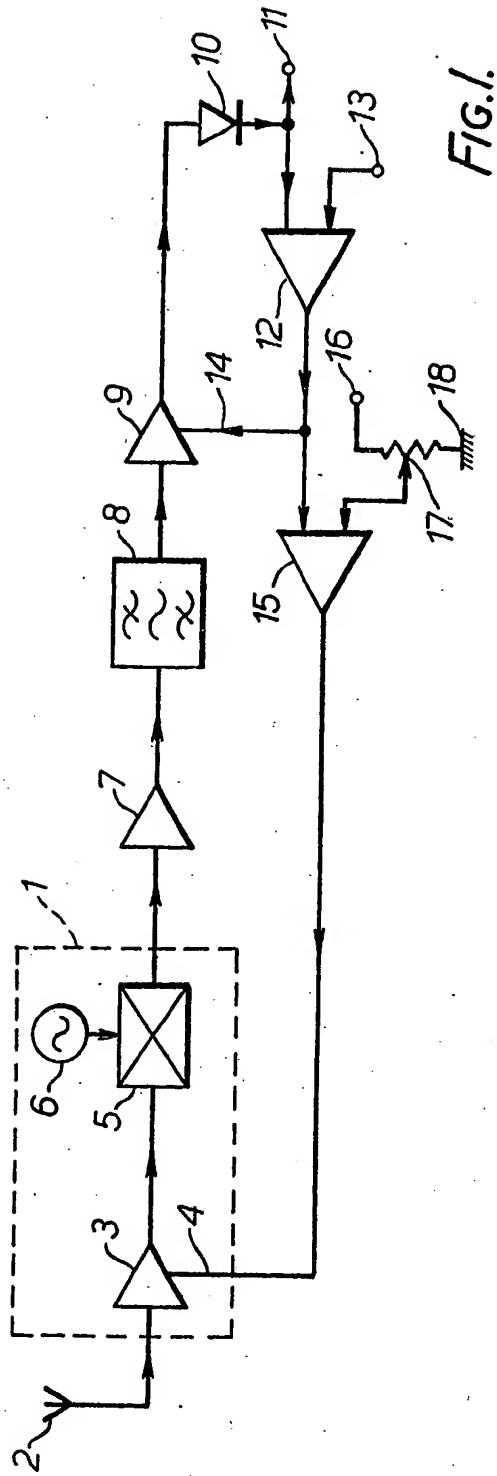
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FIG.1.

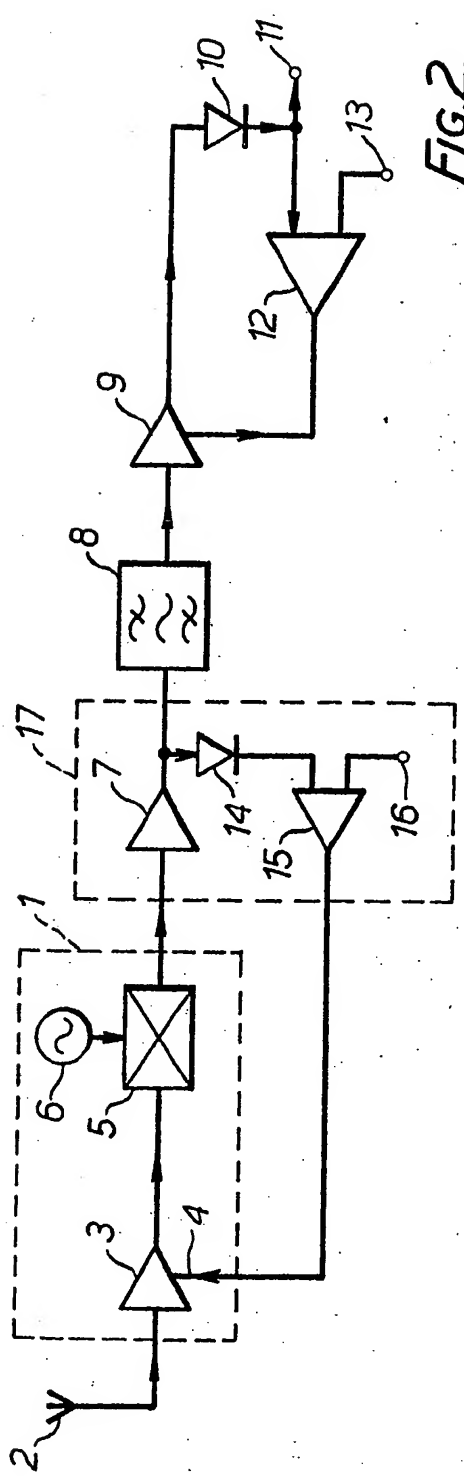
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FIG.2.

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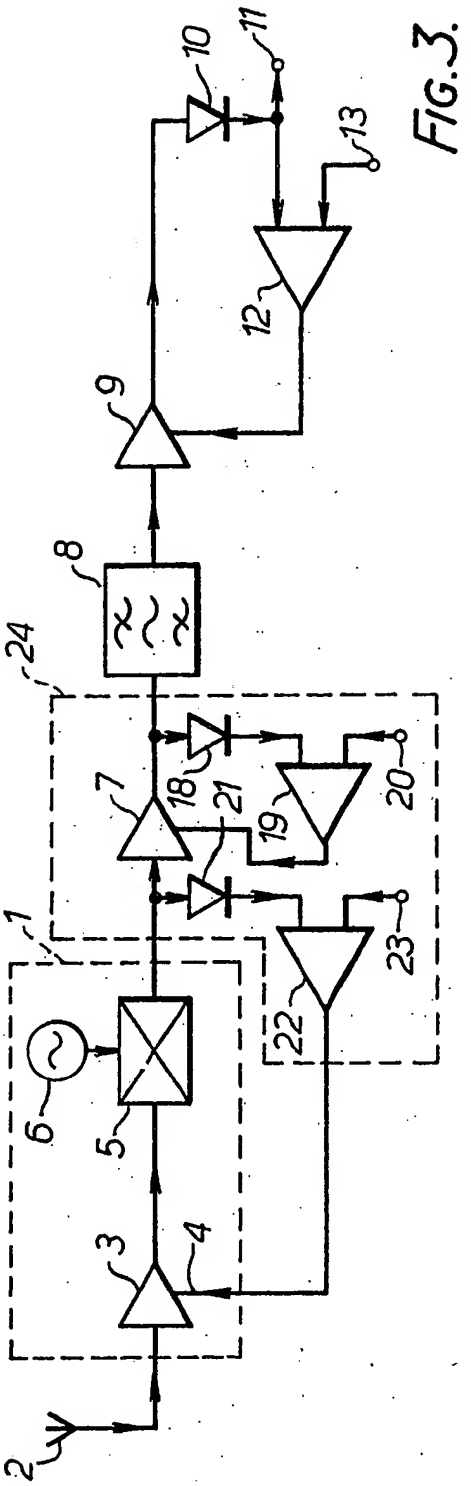

FIG.3.

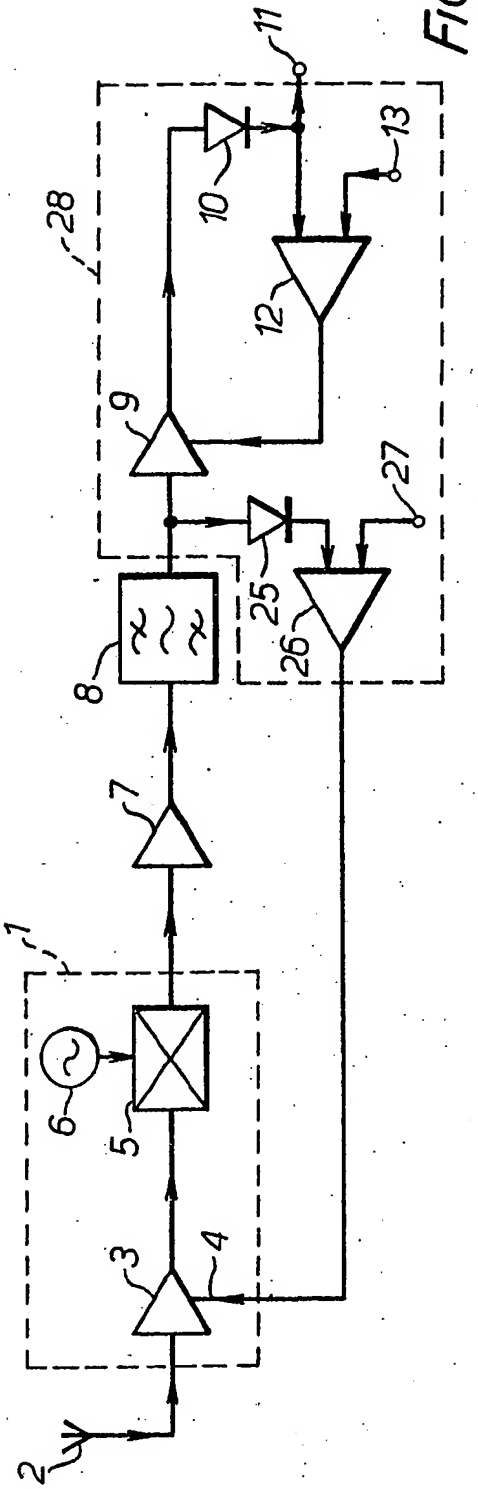

FIG.4.

SPECIFICATION

Receiver circuit arrangement

This invention relates to a receiver circuit arrangement and in particular applicable to a television circuit arrangement for providing tuner automatic Gain Control (A.G.C.).

A known television circuit arrangement is shown in Figure 1 of the accompanying drawings. Referring to Figure 1, a tuner shown within dashed block 1 is arranged to receive a signal from an aerial 2. The tuner includes an R.F. amplifier 3 having an A.G.C. input 4 by means of which the gain of the tuner 1 is controlled. The amplifier 3 feeds the received signal to one input of a mixer 5 which receives a second input from a local oscillator 6 to provide an I.F. signal.

The I.F. signal is amplified by an amplifier 7 and pared through an I.F. 'signal' path block filter 8 which is commonly a surface acoustic wave (S.A.W.) filter. After filtering the I.F. signal is amplified in an I.F. amplifier 9 which is provided with A.G.C. The amplified I.F. signal is detected in a detector 10 and video output signals appear at terminal 11.

The video output signals are also fed to one input of a comparator 12 where they are compared with a reference signal applied at terminal 13. The comparator 12 provides an output signal which provides the A.G.C. input for the amplifier 9 at 14.

The output of the comparator 12 is also fed to one input of a second comparator 15 which has a second input derived from a reference signal input at a terminal 16 via a tapping 17 of a potentiometer 18.

The above arrangement is found to have disadvantages. The A.G.C. input for the tuner 1, derived from the A.G.C. signal for the I.F. amplifier 9 provided by the comparator 12. The I.F. amplifier 9 has, in practice a very steep characteristic of gain verus A.G.C. signal, i.e. small changes in the A.G.C. signal produce large changes in gain. This means that the reference input to the comparator 15 must be set precisely by adjustment of the tapping 17 of the potentiometer 18. Further the characteristic of amplifier 9 can vary considerably form one amplifier to another. The output level from the comparator 12 is not accurately defined and tapping 17 must be individually and manually set for each circuit arrangement and this setting will only be accurate at one temperature.

A.G.C. control for the tuner 1 is as explained obtained by serving the video signal output level but this is not an accurate measure of the signal level through the tuner 1.

This invention seeks to provide a receiver circuit arrangement in which the above defects are mitigate.

According to this invention there is provided a receiver circuit arrangement for providing tuner A.G.C. comprising a tuner detector means arranged to provide a signal representative of the level of an I.F. signal afforded by the tuner and comparator means for comparing the representative signal with a reference level to provide a control signal for the tuner.

It is convenient to provide an I.F. signal path filter in which case it is preferred to arrange the detector means to sense the level of the I.F. signal prior to filtering by the said filter.

Advantageously the signal path filter is a surface acoustic wave (S.A.W.) filter.

Amplifier means may be provided for amplifying the I.F. signal prior to filtering by the S.A.W. filter, in which case it is advantageous to arrange the detector means to sense the level of the I.F. signal between the amplifier means and the filter. Preferably the amplifier means, the detector means and the comparator means are provided as a semiconductor integrated circuit.

In a second embodiment a further detector means may be arranged to provide a signal representative of the I.F. signal level output of the said amplifier means and further comparator means may be provided for comparing the signal representative of the I.F. signal level output of the said amplifier means with a further reference level to provide an A.G.C. signal for the amplifier means.

In this case the said detector means may be arranged to detect the I.F. signal level prior to the said amplifier means.

Said amplifier means, said detector means, said further detector means, said comparator means and said further comparator means may be provided as a semiconductor integrated circuit.

This invention will now be described by way of example with reference to Figures 2 to 4 of the accompanying drawings in which

Figure 2 shows a circuit arrangement in accordance with this invention,

Figure 3 shows an alternative arrangement and Figure 4 a further alternative embodiment.

In Figures 2 to 4 like parts to those of Figure 1 bear like reference numerals.

Referring to Figure 2, the arrangement is similar to that of Figure 1 having a tuner 1 receiving an R.F. signal from an aerial 2, the tuner comprising an amplifier 3, oscillator 6 and mixer 5. The tuner output is amplified by the amplifier 7, filtered by the surface acoustic wave filter 8 and, after amplifying in an I.F. amplifier 9 is detected by a detector 10 to provide a video output signal at terminal 11. As before an A.G.C. signal for the I.F. amplifier 9 is obtained by comparing the detected video output signals with a reference signal at terminal 13, in a comparator 12.

The comparator 12 does not now provide a signal for the derivation of an A.G.C. signal for the tuner 1 but this is now derived by means of a detector 14 arranged to detect the I.F. signal level at a point between the amplifier 7 and the filter 8. The detected signal level from the detector 14 is applied to one input of a comparator 15 which receives a reference signal input from a terminal 16. The comparator provides an output signal which is fed as an A.G.C. signal to the tuner 1. The amplifier 7, detector 14 and the comparator 15 are formed as a semiconductor integrated circuit as indicated by the dashed box 17.

As can be seen the A.G.C. signals for the tuner 1 are now obtained by directly sensing the signal level at a point in the I.F. signal path prior to video detection. This level is directly proportional to the level

through the R.F. tuner, rather than, as in the prior art arrangement of Figure 1 being only indirectly related.

Since the tuner A.G.C. is not now dependent upon the variable A.G.C. characteristic of the amplifier 9, a precisely defined A.G.C. signal level can be obtained by applying a suitable reference signal level to the terminal 16 and this will not be affected by temperature variations in the characteristic of the amplifier 9.

A further advantage with this arrangement is that since the tuner A.G.C. is derived prior to I.F. filtering by the signal path blocking filter 8, the A.G.C. will be sensitive to out-of-band signal noise and will operate to reduce the gain of the tuner 1 under noisy conditions.

It may be required to provide the amplifier 7 with A.G.C. and an embodiment of the invention in which this is done is shown in Figure 3.

In Figure 3 a detector 18 detects the signal level of the output from the amplifier 7 and this is applied to one input of a further comparator 19, a reference input for the comparator 19 is obtained via a terminal 20. The comparator provides an output which is applied as an A.G.C. signal for the amplifier 7.

Tuner A.G.C. signals are now derived by detecting the signal level prior to the amplifier 7 by means of a detector 21. A comparator 22 compares the detected level with a reference signal applied to terminal 23. The output of the comparator 22 provides A.G.C. for the tuner 1.

This arrangement has the advantage that the tuner and the I.F. amplifiers 7 and 9 are separately gain controlled but is not preferred since the signal level prior to the amplifier 7 is much smaller and less easily detected than that after the amplifier and it is preferred to utilise this higher signal level for the provision of tuner A.G.C. The items shown within the dashed box 24 would be provided as an integrated circuit.

A further alternative is shown in Figure 4. Here the tuner A.G.C. is derived via a detector 25 and comparator 26 arranged to respond to the I.F. signal level after the filter 8 but prior to video detection. Comparator reference level is provided at a terminal 27. The components within the dashed block 28 would be provided as an integrated circuit. Whilst this arrangement avoids the outlined disadvantages of the Figure 1 arrangement it is not preferred since a lower signal level exists after the filter 8 than before it and also the A.G.C. is now no longer sensitive to the out-of-band noise signals.

The embodiments described are exemplary only and other arrangements are possible within the scope of the invention. For example the filter 8 need not be a surface ware filter. Further, whilst the detectors are illustrated as diodes, this is only for simplicity of explanation and other types of more complex detectors as shown in the art may be employed.

Whilst described with respect to a television receiver circuit arrangement the invention is applicable to other forms of receiver circuits.

CLAIMS

1. A receiver circuit arrangement for providing tuner AGC comprising a tuner, detector means arranged to provide a signal representative of the level of an IF signal afforded by the tuner and comparator means for comparing the representative signal with a reference level to provide a control signal for the tuner.

2. A receiver circuit arrangement as claimed in claim 1 and including an I.F. signal path filter.

3. A receiver circuit arrangement as claimed in claim 2 in which the detector means is arranged to sense the level of the I.F. signal prior to filtering by the said filter.

4. A receiver circuit arrangement as claimed in claim 2 or 3 in which the signal path filter is a surface acoustic wave (S.A.W.) filter.

5. A receiver circuit arrangement as claimed in claim 4 in which amplifier means is provided for amplifying the I.F. signal prior to filtering by the S.A.W. filter.

6. A receiver circuit arrangement as claimed in claim 5 in which the detector means is arranged to sense the level of the I.F. signal between the amplifier means and the filter.

7. A receiver circuit arrangement as claimed in claim 5 or 6 in which the amplifier means the detector means and the comparator means are provided as a semi-conductor integrated circuit.

8. A receiver circuit arrangement as claimed in claim 5 in which a further detector means is arranged to provide a signal representative of the I.F. signal level output of the said amplifier means and further comparator means is provided for comparing the signal representative of the I.F. signal level output of the said amplifier means with a further reference level to provide an A.G.C. signal for the amplifier means.

9. A receiver circuit arrangement as claimed in claim 8 in which the detector means is arranged to detect the I.F. signal level prior to the said amplifier means.

10. A receiver circuit arrangement as claimed in claim 8 or 9 in which the said amplifier means, the said detector means, said further detector means, said comparator means and said further comparator means are provided as a semi-conductor integrated circuit.

11. A receiver circuit arrangement as claimed in claim 2 in which the detector means is arranged to sense the level of the I.F. signal after filtering by the said filter.

12. A receiver circuit arrangement substantially as herein described with reference to and as illustrated in any one of Figures 2 to 4 of the accompanying drawings.

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